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FISCAL RULES AND GOVERNMENT SIZE IN THE EUROPEAN UNION*

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ABSTRACT

This paper studies the impact of national fiscal rules on government size as measured by the ratio of government expenditures to gross domestic product. We develop a model of the budgetary process and show that a common pool problem may arise which can be mitigated through fiscal rules. We test the model's predictions using a novel time-series cross-section dataset of 27 European Union members for the period between 1990 and 2011. Corroborating the model, we find that fiscal rules have a negative impact on government size. Contrasting the model, their impact becomes smaller as the number of ministers increases.

KEYWORDS: Political fragmentation; Fiscal rules; Government size
JEL-CODES: H11, H61, E61

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1. Introduction

Fiscal governance of incumbent and potential members has been a key issue on the European Union (EU) policy agenda ever since its inception. In 1992, the Maastricht Treaty established that government deficits should not surpass 3% of the gross domestic product (GDP) and government debt should remain less than 60% of GDP. The introduction of the Stability and Growth Pact (SGP) in 1997 institutionalized these two rules and reinforced the union-wide fiscal framework. With the advent of the current sovereign-debt crisis, fiscal governance has once again reached the top spot of the EU agenda. In contrast to the union-wide rules introduced throught the '90s, the current debate has been pivoting towards fiscal rules at the national level. In 2011, for instance, constitutional reforms in Germany and Spain approved the introduction of national deficit rules. This type of rules has the advantage that it can be adapted to the particularities of individual countries while, at the same time, can target union-wide goals.

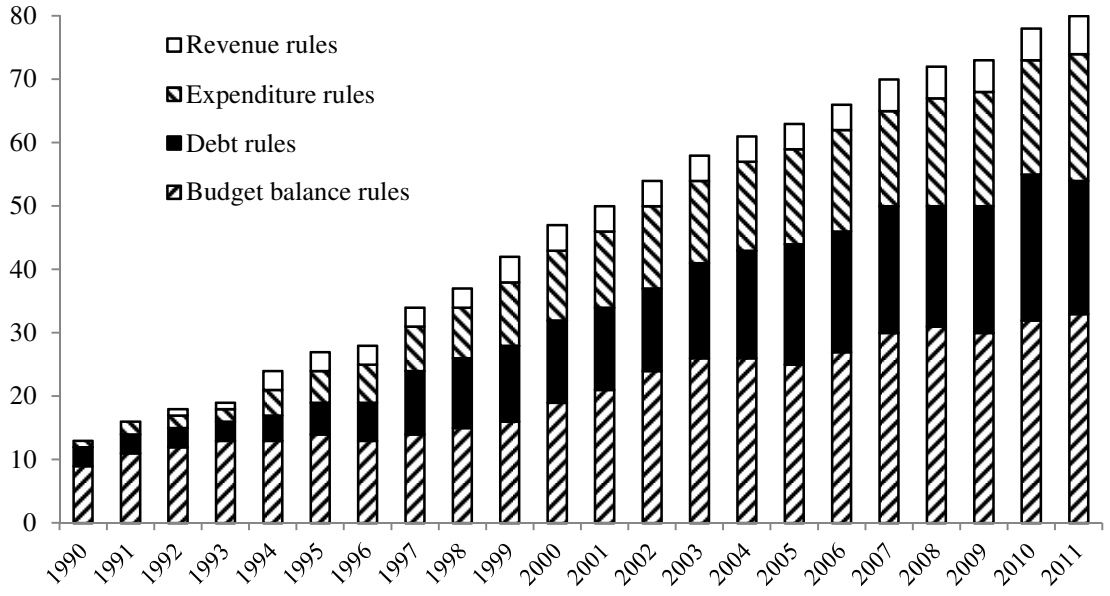
Fiscal rules, particularly in the EU, have been in the mainstay of political economy research since von Hagen and Harden (1995) set the theoretical and empirical grounds for their study.[1] Wyplosz (2005, 2011) qualifies the enthusiasm about fiscal rules by highlighting that their benefits can be dulled by politicians using escape clauses to circumvent them. Von Hagen (2006) attempts to clear this doubt by providing empirical evidence. He constructs a fiscal rule index and shows that it has a positive effect on the average budget balance throughout a cross section of EU countries. Debrun *et al.* (2008) extend von Hagen's analysis by showing that the positive relation between fiscal rules and the budget balance can also be observed in a time-series cross-section analysis. De Haan *et al.* (2013) contribute to the preceding analyses by focusing on the direct effect of fiscal rules and on how their efficacy is affected by the number of ministers as well as their different political affiliations.

The state of the current policy debate and academic literature is the starting point for this paper in which we study the impact of national fiscal rules on the size of the government (*i.e.,* public expenditures as a share of GDP). Therefore, we draw attention to the evaluation of fiscal rules, which, put in a broader context, are a particular type of budgetary institution. The latter are the formal and informal arrangements that shape the process by which governments

[1] Wierts (2008) and Eslava (2011) provide skilful surveys of the current state of the literature. Therefore, we restrict the current discussion to the contributions most directly related to our own analysis. Notice that literature on fiscal rules is strongly intertwined with the literature on the impact of government fragmentation on fiscal outcomes. See, for instance, Kontopoulos and Perotti (1999) who conclude that governments with more ministers spend more. In recent years Feld and Schaltegger (2009) and Petterson-Lidbom (2012) have reassessed these conclusions using natural experiments in Switzerland and two Scandinavian countries, respectively. We refer the reader to these articles, and the references therein, for a detailed depiction of this literature.

form and execute their annual budget (Hallerberg *et al.,* 2009). In turn, as defined by Kopits and Symansky (1998): "[fiscal rules are] a permanent constraint on fiscal policy, expressed in terms of a summary indicator of fiscal performance." Depending on which indicator is employed, fiscal rules can be classified as being either budget balance, debt, revenue or expenditure rules. While fiscal rules are not the only budgetary institutions in place or under consideration (see, Wyplosz (2005, 2011) and Hallerberg *et al.,* (2009)), we focus on them due to the attention they receive in the current debate on fiscal governance in the EU.[2]

Figure 1: Numerical Fiscal Rules in Force in the EU-27 Countries (1990-2011)



Source: European Commission. Directorate General for Economic and Financial Affairs.

Figure 1 traces the development of the number of fiscal rules that have been in place between 1990 and 2011 in the 27 countries that formed the EU between January 2007 and July 2013. The figure shows a consistent upward trend in the number of fiscal rules in the various EU countries. That is, while in 1990 only 13 fiscal rules were in place, by 2011 a total of 77 fiscal rules were in place. The increase in the number of fiscal rules has been driven mainly by an increase in expenditure, debt and budget rules. Revenue rules, on the other hand, represent a lower share of the total increase. Although the impact of each type of fiscal rules could potentially be assessed individually, we choose to follow a holistic approach and

[2] There are strands of the literature that investigate the effect of other type of public institutions on fiscal outcomes. For instance, Funk and Gathmann (2013) study the effects of electoral systems on fiscal policy. Here we restrict out attention to fiscal rules at the national level.

consider an aggregation of these rules into a common index. This index is the Fiscal Rules Strength Index as compiled by the European Commission and further outlined in Section 3.

As shown by Eslava (2011), much of the discussion on fiscal rules is grounded on their effect on the public deficit. In this regad, however, it is adamant to understand where the deficits come from in the first place. To this end, consider the development of spending and revenues over time in the EU. Throughout the beginning of the 1990s revenue hovered at 45% of GDP, after that it declined to about 42% and has stayed there until the late 2000s and early 2010s. Spending, in contrast, has been substantially higher and substantially more volatile throughout this period. Indeed, in the early 1990s spending increased from 46% of GDP in 1990 to a whopping 52% in 1993 (compared to 44% and 47% revenue, respectively). After that, and possibly in anticipation of the SGP, spending decreased to 44% of GDP but only to increase again to a new peak of 49% towards the end of the 2000s.

Hence, in light of the fact that expenditures are the main driving force behind the deterioration of government finances in the EU, we choose this aggregate as our dependent variable. Furthermore, the focus on the deficit assumes that countries only run into problems when there are red numbers in the budget balance. Contrary to this approach, we presume that profligacy of public resources takes place independently of the budget balance situation. Therefore, it is relevant to study whether fiscal rules are able to keep expenditures in check in a context in which political fragmentation exerts pressure for high spending. By focusing on this issue we do not wish to take a stand on whether government should intervene in the economy or not. We simply study whether national fiscal rules are able to curb political fragmentation and bring government size close to the optimal level. The determination of the optimal size of government is beyond the scope of this paper.

To set ideas, we commence by developing a simple model of the budgetary process. The model builds on the contribution by von Hagen and Harden (1995), who consider a static game played between various ministers. They highlight that, in the absence of a social planner, spending will be higher than the social optimum, which can be considered as a particular instance of the common pool problem (Hardin, 1968). They go on to show that delegating discretion over the budget to an all-powerful (finance) minister can bring spending closer to the social optimum. We extend their model by allowing for fiscal rules which aim at controlling fiscal aggregates. We show that, just like delegating to a single minister, each of these rules can bring spending closer to the social optimum. The model predicts that this effect will be larger the higher is the number of ministers participating in the budgetary process. Using this prediction, the model provides a direct test of whether there is only the

common pool problem or if there are also additional mechanisms that drive government spending beyond its optimum.

We assess the empirical predictions of the model using a novel time-series cross-section dataset comprising 27 members of the EU from 1990 until 2011. Since fiscal rules cannot be randomized, we pursue an identification strategy that aims at emulating randomization while using observational data. Following Imbens and Wooldridge (2009), we follow a regression approach in which we control for the variables that potentially generate confounding effects. In Section 3 we use Directed Acyclic Graphs to explain in detail which control variables we use and why. Regarding the regression equation specification, we rely on a multiplicative interaction model along the lines of de Haan *et al.* (2013). In that way, we intend to measure the effect of fiscal rules on government size in the presence of political fragmentation.

From an estimation perspective, our analysis deviates from much of the current political economy literature by challenging the status quo of the fixed-effects model. Specifically, we assess the robustness of our empirical results to the use of the so-called within-between estimator suggested by Mundlak (1978) and recently resuscitated by Bell and Jones (2014). Estimating the multiplicative interaction model with a variety of different techniques while carfully selecting the relevant control variables provides empirical results which we can contrast with our model predictions. In particular, we find that fiscal rules have a significant negative effect on total government expenditures and that this effect declines as the number of ministers participating in the budgetary process increases. The latter finding implies that the common pool problem is not the only mechanism that drives government size beyond its optimal level. Understanding these additional mechanisms provides a natural allay for future research.

Our paper contributes to the current state of the literature in a number of different ways. First of all, by extending the model of von Hagen and Harden (1995) we highlight the mechanisms at play when fiscal rules are imposed in the budgetary process. Second, in contrast to de Haan *et al.* (2013), our empirical analysis spans a longer sample period than previous analyses and relies on the fiscal rules index compiled and employed by the EU itself. Third, by going beyond the commonly used fixed-effects specification of time-series cross-section models we show how between as well as within group variation can be utilized successfully in politically economy research. In concert, these contributions allow us to conclude that fiscal rules are successful in curbing government spending. However, their effect is diminished by the number of ministers. The latter result suggests that there is

something more than a common pool problem in the interplay between fiscal rules and governent size.

The remainder of the paper is set up as follows. The next section develops and analyses the theoretical model of the budgetary process. Sections 3 and 4 discuss the empirical methods and introduce the dataset. Section 5 portrays the empirical results and assesses their robustness to a variety of different estimation techniques. The final section concludes and an appendix provides additional details concerning the fiscal rules index we employ.

2. Model

We consider a game-theoretical model of the budgetary process in which a number of government ministers must decide over the size of the budget. Our model extends that of von Hagen and Harden (1995) by considering additional forms of budgetary institutions. We start by setting out the general properties of the model and show how a decentralized budgetary process can lead to overspending compared to the social optimum achieved by a central planner. We then turn to the core of our analysis, which is to show that fiscal rules can bring spending closer to its social optimum. We also show how this effect is moderated by the level of fragmentation (*i.e.* the number of ministers) in the budgetary process.

2.1 Centralized equilibrium

The government consists of N ministers M_i, $i = 1,2,...,N$ and the budgetary process consists of two stages: the preparation stage and the implementation stage. In the preparation stage of the budget each ministers is assigned an expenditure target x_i^*. In the implementation each ministers spends an actual amount x_i, which need not equal x_i^*. The objective of the central planner is to maximize the following social-welfare function:

$$U = -\frac{\alpha}{2}\sum_{i=1}^{N}\left(x_i - x_i^*\right)^2 - \frac{m}{2}T^2, \tag{2.1}$$

where the summation measures the utility loss implied by the deviations from the policy targets, α measures the weight the social planner gives to these losses, T^2 is the total tax burden incurred by raising taxes T and $m \in (0,1]$ indicates the weight the social planner assigns to the utility loss of the tax burden. The social planner must consider the government

budget constraint which states that total revenues must equal the sum of all expenditures (*i.e.*, $T = \sum_{i=1}^{N} x_i$).

Maximizing the social-welfare function subject to the budget constraint and imposing symmetry between ministers allows writing the optimal level of per-minister expenditure as:

$$x^C = \frac{\alpha x^*}{Nm + \alpha}, \tag{2.2}$$

where x^C denotes the optimal level of per-ministers expenditure. With all ministers being symmetric, government size (*i.e.*, total expenditures) is given by:

$$T^C \equiv Nx^C = N\frac{\alpha x^*}{Nm + \alpha} \tag{2.3}$$

where T^C denotes the optimal government size.

2.2 Decentralized equilibrium

Having established the first-best optimum we turn to the decentralized equilibrium in which each minister maximizes his/ her own welfare function. In accord with the social planner, the objective of each minister is to satisfy the policy target while keeping the tax burden limited. However, in contrast to the social planner, the individual ministers do not take into account the full force of the additional tax burden created by additional spending. The welfare function of the individual minister is given by:

$$U_i = -\frac{\alpha}{2}\left(x_i - x_i^*\right)^2 - \frac{m_i}{2}T^2, \tag{2.4}$$

where $m_i \in (0, m)$, which implies that each minister only considers the share of the tax burden emanating from his/ her own department while ignoring taxes that have to be raised by other departments. As before, the optimization problem must consider the government budget constraint. Performing the individual optimization problem for minister j leads to:

$$x_j = \frac{\alpha x_j^* - m_j \sum_{i \neq j} x_i}{m_j + \alpha}, \tag{2.5}$$

which is a reaction function showing that the expenditures of a particular minister j depend negatively on the expenditures of all other ministers. Imposing symmetry between ministers and letting $m_j = m / N$ provides optimal per-minster spending and the associated government size:

$$x^D = \frac{\alpha x^*}{m + \alpha}, \tag{2.6}$$

$$T^D \equiv N x^D = N \frac{\alpha x^*}{m + \alpha}. \tag{2.7}$$

Comparing (2.6) and (2.7) to (2.2) and (2.3) shows that $x^D > x^C$ and $T^D > T^C$, which implies that in the decentralized equilibrium both per-minister spending and government size are higher. This discrepancy is a particular instance of the so-called common pool problem (Hardin, 1968).

To appreciate the relation between the extent of the common pool problem and the number ministers we define the ratio between the decentralized and the centralized solution:

$$\frac{T^D}{T^C} = N \frac{\alpha x^*}{m + \alpha} / N \frac{\alpha x^*}{Nm + \alpha} = \frac{Nm + \alpha}{m + \alpha} > 1. \tag{2.8}$$

Taking the first derivative of (2.8) with respect to the number of ministers N immediately reveals:

$$\frac{\partial T^D / T^C}{\partial N} = \frac{m}{m + \alpha} > 0, \tag{2.9}$$

which implies that the common pool problem becomes more prevalent as the number of ministers participating in the budgetary process increases.

2.3 Revenue and expenditure rules

A variety of fiscal rules have been suggested in to counteract the overspending associated with the common pool problem. In their original model von Hagen and Harden (1995) show that delegating discretion over the budget to an all-powerful (finance) minister can bring spending closer to the social optimum. Intuitively, with such a construction, the budgetary process resembles better the centralized equilibrium and, therefore, exhibits less excessive

spending. In what follows we use their framework as outlined above to analyse how expenditure and revenue rules can be used to achieve a similar outcome.

Revenue and expenditure rules consist of, respectively, limits to total revenue collected and to expenditures per minister. In terms of our model, these rules impose upper bounds on T and x denoted by $\overline{T}$ and $\overline{x}$. For the optimization problem they imply that, in addition to the budget constraint, each minister also has to take into account an inequality constraint. These are given by:

$$x_j + \sum_{i=1}^{N-1} x_i \leq \overline{T} \tag{2.10}$$

$$\text{and } x_j \leq \overline{x}, \tag{2.11}$$

where (2.10) is the constraint imposed if a revenue rule is in place and (2.11) is the one imposed if an expenditure rule is in place.

Using either of the additional constraints in the maximization problem of an individual minister leads to:

$$x_j = \frac{\alpha x_j^* - m_j \sum_{i \neq j} x_i - \lambda}{m_j + \alpha}, \tag{2.12}$$

where λ is the utility gain from a relaxation of a constraint.[3] Imposing symmetry once again and letting $m_j = m / N$, as before, leads to the following per-minister level of expenditure and associated government size:

$$x^R = \frac{\alpha x^* - \lambda}{m + \alpha}, \tag{2.13}$$

$$T^R \equiv N x^R = N \frac{\alpha x^* - \lambda}{m + \alpha}, \tag{2.14}$$

where the superscript R indicates outcomes of the budgetary process in which fiscal rules are in place. Comparing (2.13) and (2.14) to their counterparts without fiscal rules in (2.6) and (2.7) reveals that if the constraints given in (2.10) and (2.11) are binding (that is, $\lambda > 0$), per-minister spending and government size are lower than if no fiscal rules are in place. As the stringency of the fiscal rules increases, so does the magnitude of λ. Hence, the upper bounds $\overline{x}$ and $\overline{T}$ can be used as policy instruments to control per-minister spending and government

[3] Formally, λ is the multiplier on the inequality constraints given in (2.8) and (2.9).

size. In fact, by setting $\bar{x} = x^C$ and/ or $\bar{T} = T^C$, fiscal rules can be used to steer the budgetary process into the centralized, and socially optimal, equilibrium.

As before we can define the ratio of actual spending and optimal government size:

$$\frac{T^R}{T^C} = N\frac{\alpha x^* - \lambda}{m+\alpha} / N\frac{\alpha x^*}{Nm+\alpha} = \frac{\alpha x^* - \lambda}{\alpha x^*}\frac{Nm+\alpha}{m+\alpha}, \tag{2.15}$$

which collapses to (2.8) if there are no fiscal rules (that is, $\lambda = 0$). In the presence binding fiscal rules (that is, $\lambda > 0$), (2.15) will be smaller than (2.8) which is captured in the following expression:

$$\frac{\partial T^R / T^C}{\partial \lambda} = \frac{-1}{\alpha x^*}\frac{Nm+\alpha}{m+\alpha} < 0, \tag{2.16}$$

which shows that binding fiscal rules reduce the discrepancy between the optimal and the actual government size. To see how the effectiveness of fiscal rules is influenced by the number of ministers participating in the budgetary process, we differentiate (2.16) once more:

$$\frac{\partial^2 T^R / T^C}{\partial \lambda \partial N} = \frac{-1}{\alpha x^*}\frac{m}{m+\alpha} < 0, \tag{2.17}$$

which implies that fiscal rules become more effective as the number of ministers increases. In that sense, fiscal rules work best when they are needed the most.

As the optimal level of spending (T^C) is not observable, we cannot test the results in (2.16) and (2.17) directly. However, using the expression in (2.14) we can state the empirical implications of the fiscal rules in the following two hypotheses:

Hypothesis 1: Fiscal rules exert a negative impact on government size: $\frac{\partial T^R}{\partial \lambda} < 0$.

Hypothesis 2: Fiscal rules are more effective if there are many ministers: $\frac{\partial^2 T^R}{\partial \lambda \partial N} < 0$.

The first hypothesis says that fiscal rules can decrease the size of the government. The second one says that the effect of the rules will be larger the greater is the extent of the common pool problem. While the first hypothesis allows us to test whether national fiscal rules are able to counteract the common pool problem, the second one provides a direct test of whether there is something more than a common pool problem in the interplay between fiscal rules and government size. Afterall, if it were only the common pool problem, fiscal rules

should be able to curb it. However, as suggested by Wyplosz (2005, 2011) other mechanisms (such as rule avoidance) may also be at play.

3. Methodology

The hypotheses outlined in the previous section imply a causal relationship of interest involving three variables. First, we want to measure the effect of fiscal rules on government size. Second, we want to see how the number of ministers forming the cabinet moderates the relationship between fiscal rules and government size. The absence of a counterfactual is a problem we have to overcome when tackling such causal relation. Following Angrist and Pischke (2009), the ideal scenario would be random assignment of fiscal rules across EU countries. Since we cannot run such an experiment we have to conform to the use of observational data. The main problem related to observational data is sample selection, *i.e.* countries with a high score in the fiscal rule index may have certain background characteristics that fundamentally differentiate them from low score countries.

As we cannot randomize, we have to design an identification strategy that allows to get as close as possible to a randomized experiment (Angrist and Krueger, 2001). According to Imbens and Wooldridge (2009), the selection problem can be solved as long as we observe the covariates that correlate both with the outcome and the explanatory variable of interest. Consequently, we follow a regression approach in which we account for the relevant covariates. The regression equation that we want to estimate is the following:

$$GSIZE = \beta_0 + \beta_1 FRSI + \beta_2 FRSI \times NSM + \beta_3 NSM + X\gamma + \varepsilon, \qquad (3.1)$$

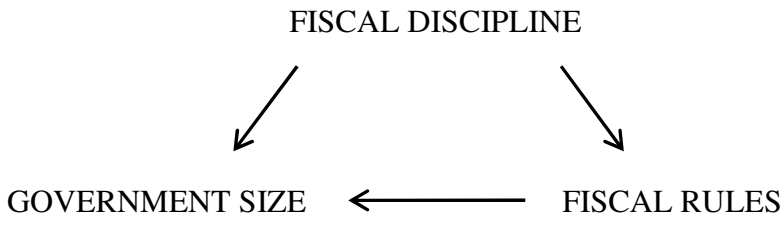
where *GSIZE* stands for government size, *FRSI* is the fiscal rules strength index, *NSM* is the number of spending ministers and the βs are the corresponding parameters. *X* is a matrix containing a column for each control variable, γ is a parameter vector with a coefficient for each control variable and ε is the disturbance term. Equation (3.1) features an interaction term between fiscal rules and spending ministers as well as each of the two variables separately. This specification allows us to compute the marginal effect of the fiscal rule index on government size as:

$$\frac{\partial GSIZE}{\partial FRSI} = \beta_1 + \beta_2 NSM, \qquad (3.2)$$

which shows that it depends on the number of spending ministers. Hypothesis 1 and 2 predict $\partial GSIZE/\partial FRSI < 0$ and $\beta_2 < 0$, respectively.

Continuing with the identification strategy, it is crucial to decide which variables to include in the *X* matrix. A successful strategy should include the covariates that correlated simultaneously with the dependent variable and the explanatory variables of interest, namely the fiscal rule index and its interaction with the number of spending ministers. As long as the covariates are observable, this strategy entails no difficulties. However, in our context, we can easily think of a potentially important covariate which is not observable; fiscal discipline. This is the inherent tendency to pursue robust (or fragile) fiscal balances due to religious, historical or other reasons. Figure 2 shows by means of a so called Directed Acyclic Graph (DAG)[4] how unobserved discipline implies a problem to our analysis. On the one hand, it affects government size by reducing the political inclination to overspend. On the other hand, countries with strong fiscal discipline are very likely to institutionalize it by implementing fiscal rules. Therefore, as shown in Figure 2, fiscal discipline is a confounding factor and, hence, the mere association between fiscal rules and government size does not reflect the true causal effect.

Figure 2: The Backdoor Path Implied by Fiscal Discipline



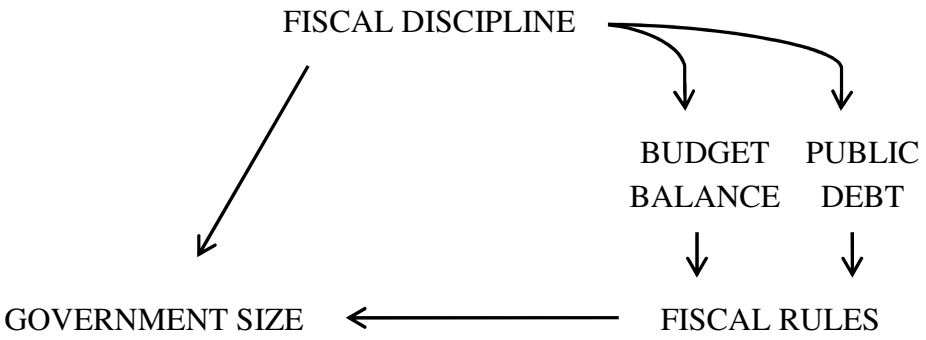
In the terminology of Pearl (1995), fiscal discipline creates a backdoor path leading to what is commonly known as omitted variable bias. In Figure 3 we show, again by means of a DAG, that the backdoor path can be blocked by controlling for budget balance and public debt. If we assume that fiscal discipline affects fiscal rules through budget balance and public debt, then we can block the backdoor path by controlling for these two. If this assumption holds, we can say that the budget balance and the level of public debt satisfy the so-called Pearl's Backdoor Criterion for this particular DAG (Pearl, 1995), meaning that controlling for them allows to identify the causal effect of fiscal rules on government size. However, an

[4] See Pearl (1995) for extensive discussion.

additional problem may occur because both variables are, at least on paper, outcomes of budgetary institutions such as fiscal rules, and thus, by including them, we may run into the bad control problem as described by Angrist and Pischke (2009). To avoid this situation we lag these two variables one period.

Besides fiscal discipline, we can think of other potentially confounding factors. For instance, whenever there is a recession government size is affected by the presence of automatic stabilizers. At the same time, recessions usually generate debates that lead to reforming fiscal institutions (Debrun *et al*, 2008). In order to control for this, we include the rate of economic growth in our matrix of covariates. Other potentially confounding factors are the political business cycle (Persson and Tabellini, 2000), that may affect both government size and the number of ministers (and thus the interaction with the fiscal rule index); the effective number of parties in government (Alesina and Perotti, 1995), that also may affect government size and the number of ministers; and the Stability and Growth Pact (de Haan *et al.*, 2004), which may affect government size as well as the presence and strength of fiscal rules. All these factors can, in one way or another, be controlled for directly. The technical details are discussed in Section 4.

Figure 3: Blocking of the Backdoor Path Implied by Fiscal Discipline



An additional relevant methodological issue is the choice of econometric technique. As detailed in Section 4 below, we employ a time-series cross-section dataset and we first consider the three standard techniques employed in the literature; pooled OLS, random-effects and fixed-effects. Pooled OLS has the problem that it does not distinguish between the time and cross-section dimensions of the data. Therefore it runs into problems of inconsistency if there are unobservable fixed country effects that are correlated with the explanatory variables. The random-effects formulation does establish a distinction between time and cross-section

dimensions. However, the cross-section dimension is not explicitly modelled and, hence, there is the same problem of potential inconsistency as with pooled OLS. In regard to the fixed-effects formulation, it solves the potential inconsistency problem by eliminating the cross-country variation altogether. In that way, it solves a potentially sever problem but it implies a considerable loss of information since it only focuses on within country variation, that is why it is known as the within estimator.

In addition to the above mentioned techniques, we also consider the so-called within-between estimator suggested by Mundlak (1978) and recently resuscitated by Bell and Jones (2014). In that way, our analysis deviates from much of the current political economy literature by challenging the status quo of the fixed-effects model. The within-between estimator is an extension of the random-effects formulation. The difference is that the former explicitly models the cross-country variation by including in the regression equation the time average of each one of the explanatory variables. Such a formulation allows us to estimate the between as well as the within effect. To the extent that there are no time invariant omitted variables (also in this case we rely on the control variables introduced above), both the within and the between effects can be unbiasedly estimated (Bell and Jones, 2014). Therefore, conditional on this assumption, we can draw conclusions about how fiscal rules affect government size over time within one country, and about how countries with a higher fiscal rule index score perform in comparison to countries with a lower score. We shed more light on this issue when we comment on our results in Section 5.

4. Data

To estimate the parameters in Equation (3.1) we use a time-series cross-section data set of the 27 countries of the EU for the period 1990-2011.[5] Therefore, we observe 27 units over 22 years, providing an estimation sample of 494 observations. To implement our empirical strategy, an important issue is how to measure fiscal rules. For this purpose, we employ a novel index constructed by the European Commission which evaluates the strength of fiscal rules according to five different criteria: statutory base of the rule, nature of the body monitoring appliance to the rule, nature of the body in charge of enforcement of the rule, enforcement mechanisms and media visibility. The index relies on a fiscal rules database which tracks all type of fiscal rules at all levels of government for all 27 countries between 1990 and 2011. For every fiscal rule within this period, the database provides a score for each

[5] We do not include Croatia since it has not yet been added to the fiscal rules database.

of the five criteria, which are the input used by the European Commission to compute the fiscal rule index using a random weights technique. The outcome of the computation is standardized such that the fiscal rule index has a mean of 0 and a standard deviation of 1.[6]

We define our dependent variable, *i.e.* government size, as the GDP percentage of cyclically adjusted total primary expenditures. We consider primary expenditures, which exclude interest payments, because we want to focus on discretional changes in public expenditure. For that same reason, we employ cyclically adjusted data, with the additional advantage that this feature renders our dependent variable stationary.

To operationalize the number of spending ministers, we follow Volkerink and de Haan (2001) who take the total number of ministers forming the cabinet and exclude the ministers without portfolio. The latter are those members of the cabinet that do not receive a specific budget allocation. In most countries, these are only two: the prime ministers and the minister of finance. However, some cabinets also feature a deputy prime minister which sometimes can be considered a minister without portfolio. In these cases, this minister is also subtracted from the total.

Regarding the control variables, for budget balance and public debt we use, respectively, the lagged difference between total public revenues and expenditures as a percentage of GDP and the lagged stock of total public debt as a percentage of GDP. For economic growth, we use the yearly percentual change in real GDP. Regarding our political controls, we use dummies for years with parliamentary elections and for years in which the Stability and Growth pact is in force. The effective number of parties is measured using a Herfindahl index for government, which is computed as the sum of squared ministerial shares of all parties in government.[7] It takes values between 0 (infinite number of parties in government) and 1 (only one party in government). Short descriptions, sources, summary statistics and correlations are given in Tables 1, 2 and 3.

5. Results

According to the two hypotheses outlined in Section 2 we expect $\partial GSIZE/\partial FRSI < 0$ and $\beta_2 < 0$, respectively. In Table 4 we provide the results of the three standard estimation

[6] For more information on the criteria and also on the method used to compute the fiscal rule index, see the appendix.

[7] Inclusion of the number of parties in government may, a priori, seem to generate a multicollinearity problem with the number of spending ministers. Even though there is some correlation between the two (that is why we include such control variable) a one to one relation is not plausible.

Table 1: Variable Operationalization and Data Sources

Variable	Operationalization	Data Source
GSIZE	Government Size: Cyclically adjusted primary expenditures of general government as a percentage of GDP.	AMECO database: European Commission.
FRSI	Fiscal Rules Strength Index: Composite fiscal rule index computed according to five criteria (for more details, see Appendix B).	European Commission (2006).
NSM	Number of Spending Ministers: Total of ministers in a cabinet minus ministers without portfolio.	Woldendorp *et al.* (2011).
EG	Rate of Economic Growth: Yearly percentage change in real GDP.	AMECO database: European Commission.
LDEBT	Lagged Gross Public Debt: Lagged of stock of total public debt as a percentage of GDP.	AMECO database: European Commission.
LBB	Lagged Budget Balance: Lagged difference between total revenues and expenditures of general government as a percentage of GDP.	AMECO database: European Commission.
ENPG	Effective Number of Parties in Government: Sum of the squared seat shares of all parties in government.	Beck *et al.* (2001)..
PE	Parliamentary Election: Dummy indicating years with parliamentary elections.	Rose and Munroe (2009).
SGP	Stability and Growth Pact: Dummy indicating presence of the Stability and Growth Pact.	European Commission.

Table 2: Variable Description and Summary Statistics

Variable	Mean	Std. dev.			Min.	Max.
		Overall	Within	Between		
GSIZE	42.69	6.07	2.88	5.37	25.01	61.86
FRSI	0	1	0.75	0.68	-1.02	2.46
NSM	15.49	3.81	1.80	3.39	7	28
EG	2.39	4.23	4.08	1.14	-15.10	9.74
DEBT	53.15	30.13	12.95	27.31	3.69	170.55
BB	-3.04	4.11	3.40	2.32	-30.94	10.09
ENPG	0.65	0.26	0.16	0.21	0.17	1
PE	0.27	0.45	0.44	0.04	0	1
SGP	0.48	0.50	0.48	0.13	0	1

Table 3: Correlation Matrix

	GSIZE	FRSI	NSM	EG	DEBT	BB	ENPG	DPE	DSGP
GSIZE	1								
FRSI	0.20	1							
NSM	0.24	0.10	1						
EG	-0.30	-0.01	-0.13	1					
DEBT	0.21	-0.29	0.17	-0.17	1				
BB	0.03	0.37	-0.16	0.16	-0.40	1			
ENPG	0.20	0.27	-0.27	0.06	-0.21	0.28	1		
PE	0.04	0.03	0.01	0.02	0.02	-0.03	-0.01	1	
SGP	0.15	0.38	-0.02	-0.16	-0.01	0.23	0.04	0.01	1

techniques frequently employed in time-series cross-section studies. The first row shows that the estimate for β_1 has a negative sign and is significant at the 5% level regardless of the estimation technique. The second row shows that the estimate for β_2 is positive and only significant when estimated by OLS.[8] The first column shows that OLS clearly overestimates β_1 and β_2 compared to the random-effects and fixed-effects results. This suggests that the OLS estimates are inconsistent because of the reasons outlined in Section 3. Therefore, the preferred option must be either random-effects or fixed effects.

As Table 3 shows, fixed-effects and random-effects estimates do not differ clearly neither in value nor in statistical significance. Nevertheless, the Hausman test reveals a significant correlation between the unobserved country effects and the explanatory variables. Hence, we consider the fixed-effects estimates as the preferred option among the three standard procedures. The third and fourth columns in Table 4 show how adding time effects, *i.e.* a dummy for every year in the sample, hardly changes the results. However, an *F*-test for the time dummies shows that they are jointly significant.[9]

At first glance, the β_1 estimate appears significant at the 5% level and the β_2 estimate appears non-significant. However, since both are part of the marginal effect of fiscal rules on government size, the significance of the estimates cannot be evaluated in isolation. Following the suggestions of Brambor *et al.* (2006), the standard error of the marginal effect of the fiscal rule index is computed as:

$$\hat{\sigma} = \sqrt{\operatorname{var}\left(\hat{\beta}_1\right) + NSM^2 \times \operatorname{var}\left(\hat{\beta}_2\right) + 2 \times NSM \times \operatorname{cov}\left(\hat{\beta}_1, \hat{\beta}_2\right)} \qquad (5.1)$$

which shows how it depends on the number of spending ministers. Based on the output in the fourth column of Table 4, Figure 4 plots the marginal effect of the fiscal rules index against the number of spending ministers bounded by the 95% confidence interval. The point estimates show an increasing pattern thus indicating that the marginal effect is conditional on the number of spending ministers. Nevertheless, this moderation effect appears of the opposite sign compared to what we expected. The theoretical model predicts that fiscal rules will be more effective when they are most needed. What we observe is, however, that the higher is the number of spending ministers, the less effective fiscal rules are in reducing the

[8] Considering the model without the interaction as a restricted version of our model (which implies dropping the variables FRSI×NSM, NSM, PE and ENPG) and performing an *F*-test reveals that the interaction should be included. Results are available on request.
[9] Results are available on request.

Table 4: Results: OLS, Random-effects, Fixed Effects

	Dependent Variable: GSIZE			
	OLS	Random-Effects	Fixed-Effects	
	(1)	(2)	(3)	(4)
FRSI	-4.181**	-2.487**	-2.619**	-2.598**
	(1.942)	(1.261)	(1.335)	(1.222)
FRSI×NSM	0.279**	0.095	0.092	0.084
	(0.115)	(0.071)	(0.071)	(0.070)
NSM	0.401*	0.118	0.093	0.025
	(0.201)	(0.113)	(0.103)	(0.113)
EG	-0.417***	-0.172***	-0.163***	-0.158*
	(0.106)	(0.047)	(0.046)	(0.082)
LDEBT	0.033	0.067	0.051	0.061
	(0.090)	(0.056)	(0.036)	(0.058)
LBB	0.091	-0.204***	-0.238***	-0.293***
	(0.160)	(0.058)	(0.065)	(0.073)
PE	0.784**	0.588***	0.581***	0.562***
	(0.281)	(0.171)	(0.171)	(0.184)
SGP	0.987	1.986***	2.580***	1.375***
	(0.778)	(0.534)	(0.530)	(0.486)
ENPG	6.729**	-0.504	0.266	0.070
	(2.447)	(0.897)	(0.883)	(1.040)
Observations	494	494	494	494
Country effects	No	No	Yes	Yes
Time effects	No	No	No	Yes
R^2	0.277	0.279	0.283	0.365

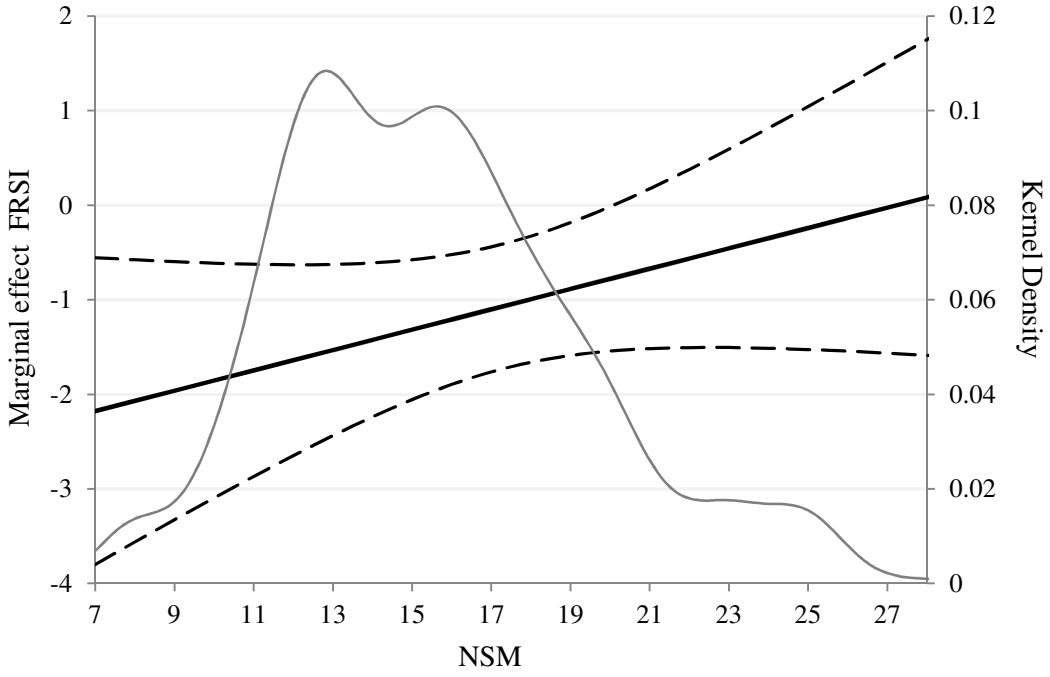
Notes: Standard errors clustered by country are in parenthesis. For a list of variable definitions and corresponding data sources refer to Table 1. *Significant at 10%; ** Significant at 5%, ***Significant at 1% (two tailed).

size of government. At the sample average of spending ministers (15.49) the marginal effect of an additional point score in the fiscal rule index is a reduction of 1.30% in government size. This result is significantly different from zero. As the number of spending ministers increases above 20, the effect of fiscal rules becomes statistically insignificant since the zero value enters the confidence interval. Therefore, these results confirm the first hypothesis while they do not confirm the second one.[10] This suggests that the common pool problem is not the only mechanism that drives government spending beyond its optimum in the budgetary process.

The results commented so far are grounded only on the variation that takes place within countries and over time. To complement our results, we employ the within-between estimator

[10] Since we use cluster-robust standard errors and rely on a small number of clusters (27 to be precise), we might run into inference problems. For that reason, following Cameron *et al.* (2008), we also computed bootstrap confidence intervals, which confirm the results in Figure 4. Results are available upon request.

Figure 4: Conditional Marginal Effect of Fiscal Rules (Within-Effect)



Notes: Dashed lines indicate 95% confidence intervals. Marginal effect and standard errors are calculated on the basis of output given in Table 4 column 4.

originally developed by Mundlak (1978) and recently resuscitated by Bell and Jones (2014). The within-between estimator is an extension of the random-effects estimator. The difference is that it explicitly models the cross-country effects by including in the regression equation the time average of each one of the explanatory variables. The time averages capture the constant and unobserved country characteristics that potentially generate an endogeneity problem when they are not modelled explicitly. The fixed-effects estimator deals with this problem by simply sweeping away all between-effects, which implies disregarding all information that derives from variation across countries.[11] Therefore, the Mundlak approach is an interesting alternative: a step forward from the fixed-effects formulation that takes advantage of all the information available in the sample.

Table 5 provides the results of estimating the parameters in (3.1) employing the within-between estimator. The first column displays the estimates for the within effects, which are the same we find in the third column of Table 4. The second and the third columns show the coefficient estimates corresponding to the time average of each explanatory variable. In the

[11] Table shows that variation between countries in our sample is substantial.

Table 5: Results: Within-Between Estimator

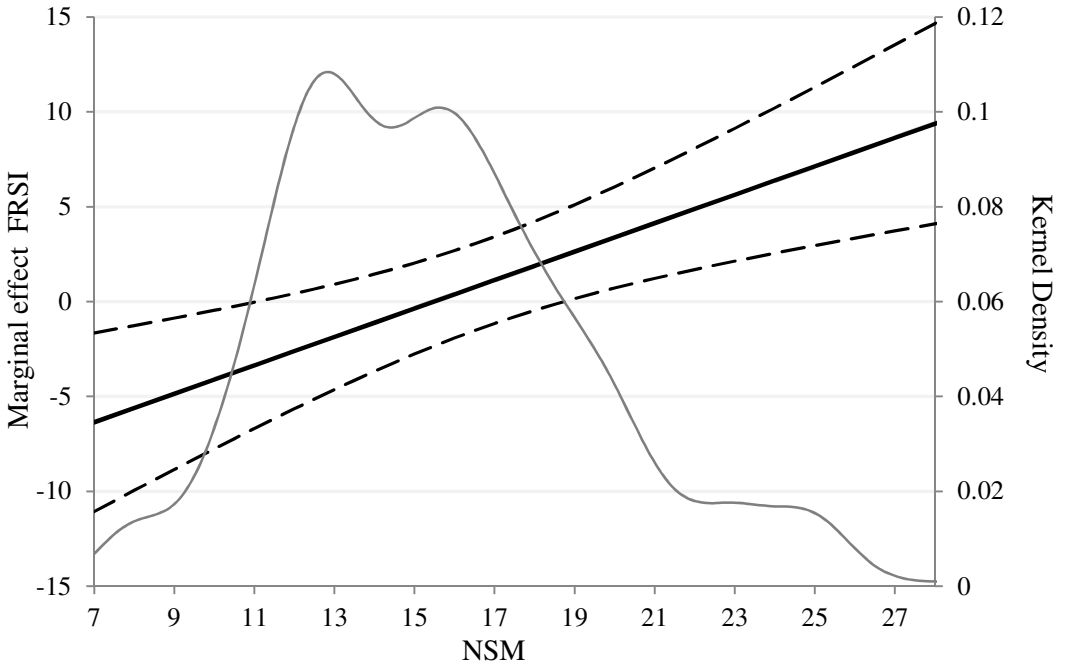
	Dependent Variable: GSIZE		
	Within Effects	Between Effects	
		Mundlak	Within-Between
	(1)	(2)	(3)
FRSI	-2.619**	-9.065**	-11.684***
	(1.335)	(4.722)	(4.198)
FRSI×NSM	0.092	0.641***	0.733***
	(0.071)	(0.142)	(0.235)
NSM	0.093	0.393*	0.486**
	(0.103)	(0.230)	(0.203)
EG	-0.163***	-1.039	-1.202*
	(0.046)	(0.676)	(0.626)
LDEBT	0.051	-0.475	-0.424
	(0.036)	(0.414)	(0.365)
LBB	-0.238***	0.076	-0.162
	(0.065)	(0.272)	(0.437)
PE	0.581***	-3.496	-2.915
	(0.171)	(3.584)	(1.140)
SGP	2.580***	0.211***	2.797***
	(0.530)	(0.025)	(0.906)
ENPG	0.266	2.203***	-1.937***
	(0.883)	(0.891)	(0.691)
Observations	494	494	494
R^2	0.283	0.671	0.671

Notes: Standard errors clustered by country are in parenthesis. For a list of variable definitions and corresponding data sources refer to Table 1. *Significant at 10%; ** Significant at 5%, ***Significant at 1% (two tailed).

second column we find the estimates obtained with Mundlak's original formulation and in the third column we find the estimates obtained with the within-between estimator. The latter is a slight variation of the former introduced recently by Bell and Jones (2014). The within-between estimator has the advantage of clearly separating the between-effect from the within-effect while Mundlak's original formulation provides the difference between the two. Looking again at the estimates for β_1 and β_2, the results are rather striking since, as we can see in the third column of Table 5, the coefficient estimates for the between-effect are much larger (preserving the same signs) and substantially more significant than the estimates for the within-effect. To the extent that there are no time invariant omitted variables, these estimates are unbiased and thus can be correctly interpreted as a reasonable approximation to the true between-effect.

Based on the output in the third column of Table 5, Figure 5 plots the marginal between-effect of fiscal rules against the number of spending ministers bounded by the 95%

Figure 5: Conditional Marginal Effect of Fiscal Rules (Between-Effect)



Notes: Dashed lines indicate 95% confidence intervals. Marginal effect and standard errors are calculated on the basis of output given in Table 4 column 4.

confidence interval. Figure 5 reveals that the between-effect of the fiscal rules is much steeper than the within-effect plotted in Figure 4, which corroborates the moderation effect found under the fixed-effects formulation. In addition, we gain significance thus the confidence interval is narrower in Figure 5. However, since the between estimate of the effect of an additional spending minister is stronger, fiscal rules are on average less effective. The impact on government size is negative and significantly different from zero as long as the number of spending ministers is equal to or smaller than 12. For values above 12, the effect of an additional spending minister disqualifies any negative effect of fiscal rules on government size.

As an aside, in light of the burgeoning discussion concerning the number of spending ministers and the size of the government (see footnote 1), we would like to briefly comment on the significance of this relation in our estimation results. The estimation results in Table 5 using the within-between estimator indicate that the increase in the number of ministers hinders the effectiveness of fiscal rules both at the within and the between margin. This suggests that there is a positive relation between fiscal rules and total public expenditures. This is in line with the original results reported by Kontopoulus and Perotti (1999). Naturally, as our estimation strategy is not aimed at identifying the effect of the number of ministers on government size, any conclusion on this relation is tentative.

To examine the robustness of the above results we expose them to a series of checks.[12] First of all, we introduce a set of dummies to control for the effect of outliers. As we can see in Table 2, there are some clear outliers in the economic growth, budget balance and debt variables. We control for those values that are at least three standard deviations away from the mean. The change in our results due to the introduction of dummies for outliers is negligible, thus we can confirm that the results are not driven by the effects of outliers. As a second check, we introduced a dummy for the countries that have been a member of the EU for the whole sample period. The intention behind this is to control for the differences between new and old EU members. What we observe in this case is that, on average old EU members have a size of government that is slightly smaller than new EU members. This result is significant at the 1% level. However, the estimates for the coefficients of interest do not significantly change when we introduce this variable. This result is confirmed when we interact the explanatory variables with the old EU members dummy variable. Therefore, we can say that the results we have discussed in this section are not driven by the differences between old and new EU members. Finally, as highlighted in footnote 10 above, we have also re-estimated the specifications in Table 4 using bootstrapped standard errors as suggested by Cameron *at el.* (2008) to avoid potential problems due the limited number of clusters in our sample. This did not change the inference drawn from our estimation exercise.

6. Conclusion

In light of the ongoing academic discussion of the impact of political forces on budgetary outcomes and with the dismal state of government finances throughout the European Union (EU) freshly in mind, we use this paper to study how fiscal rules can be used to curb excessive government spending. To set ideas, we begin by extending the influential model of von Hagen and Harden (1995) to allow for the treatment of the type of fiscal rules being employed or suggested throughout the EU at the moment. From this model we are able to distil two empirical predictions, which tell us 1.) that fiscal rules reduce government spending and 2.) that their ability to do so is best when there many ministers that take part in the budgetary process. The latter implication serves as a direct test of whether more ministers simply increases the common pool problem or whether other mechanisms are at play as well.

Using a careful identification strategy based on the Directed Acyclic Graphs suggest by Pearl (1995) combined with a novel time-series cross-section dataset for 27 EU countries

[12] The results of the robustness analyses are available on request.

spanning from 1990 to 2011 we test the empirical predictions by employing standard estimation techniques as well as the recently resuscitated (Bell and Jones, 2014) within-between estimator that was initially suggested by Mundlak (1978). Our estimation results corroborate the first prediction of the theoretical model but refute the second one. This implies that fiscal rules are effective in curbing excessive government spending but that the common pool problem is not the only mechanism that drives government spending beyond its optimum. Interesting arguments that go in the direction of unveiling these additional mechanisms are given by Wyplosz (2005, 2011) and Debortoli and Nunes (2013). The first argues that politicians tend to look for escape clauses that allow them to circumvent previously established rules, while the second points at the reinforcement between lack of commitment and lack of credibility. Understanding these additional mechanisms and their interplay with the common pool problem is a key area for future research.

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Appendix[13]

The fiscal rules strength index (FRSI) was calculated by the European Commission services taking into account five criteria: the statutory base of the rule; whether there is an independent monitoring of the rule; the nature of the institution responsible for the enforcement of the rule; the existence of pre-defined enforcement mechanisms; and the media visibility of the rule. This appendix provides details on how the scores were attributed for each of these criteria and on the calculation of the synthetic index measuring the strength of individual fiscal rules.

Criterion 1: Statutory base of the rule

The score of this criterion index is constructed as a simple average of the two elements below:

Statutory or legal base of the rule

4 is assigned for a constitutional base

3 if the rule is based on a legal act (e.g. Public finance Act, Fiscal Responsibility Law)

2 if the rule is based on a coalition agreement or an agreement reached by different general government tiers (and not enshrined in a legal act)

1 for political commitment by a given authority (central or local government, Minister of Finance)

Room for setting or revising objectives

3 if there is no margin for adjusting objectives (they are encapsulated in the document underpinning the rule)

2 there is some but constrained margin in setting or adjusting objectives

1 there is complete freedom in setting objectives (the statutory base of the rule merely contains broad principles or the obligation for the government or the relevant authority to set targets)

Criterion 2: Nature of the body in charge of monitoring respect of the rule

The score of this criterion index is calculated as follows:

3 if there is a monitoring by an independent authority (Fiscal Council, Court of Auditors or any other Court) or the national Parliament

2 monitoring by the Ministry of Finance or any other government body

1 no regular public monitoring of the rule (there is no report systematically assessing compliance)

[13] This appendix draws on European Commission (2006).

The score of this variable is augmented by one point in case there is a real time monitoring of compliance with the rule(e.g. existence of alert mechanisms in case there is a risk of non-respect of the rule).

Criterion 3: Nature of the body in charge of enforcement of the rule

The score of this criterion index is calculated as follows:

3 enforcement by an independent authority (Fiscal Council or any Court) or the National Parliament

2 enforcement by the Ministry of Finance or any other government body

1 no specific body in charge of enforcement

Criterion 4: Enforcement mechanisms of the rule

The score of this criterion index is calculated as follows:

4 there are automatic correction and sanction mechanisms in case of non-compliance

3 there is an automatic correction mechanism in case of non-compliance and the possibility of imposing sanctions

2 the authority responsible is obliged to take corrective measures in case of non-compliance or is obliged to present corrective proposals to Parliament or the relevant authority

1 there is no ex-ante defined actions in case of non-compliance

The score of this variable is augmented by 1 point in case escape clauses are foreseen and clearly specified.

Criterion 5: Media visibility of the rule

The score of this criterion index is calculated as follows:

3 is assigned if the rule observance is closely monitored by the media, and if non-compliance is likely to trigger a public debate

2 for high media interest in rule-compliance, but non-compliance is unlikely to invoke a public debate

1 for no or modest interest of the media

In absence of strong theoretical base or preference regarding the weight to be given to each criterion, the Commission services decided to calculate the synthetic index in a large number of different ways, reflecting different possible weightings for the five criteria. The scores of the five criteria were first standardized to run between 0 and 1. Then, a random weights technique was used, which uses 10.000 sets of randomly-generated weights to calculate the synthetic indicator in 10.000 different ways. The random weights are drawn from a uniform

distribution between zero and one and then normalized to sum to one. The resulting distribution for the synthetic indicator reflects the possible range of values given no a priori information on the weight to be given to each component of the index. Given that the weights are drawn from a uniform distribution, the mean value of the synthetic indicator is asymptotically equivalent to the indicator calculated using equal weights for the constituent components (unweighted arithmetic average).

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